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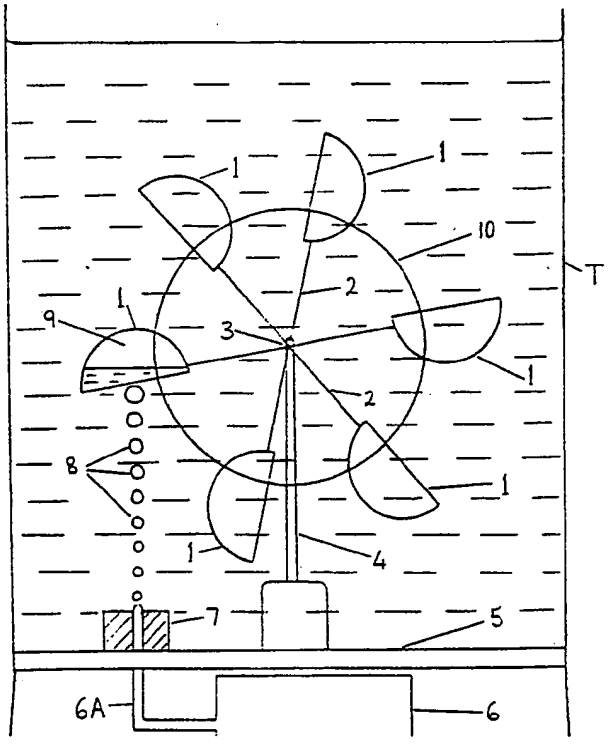
(54) Pressurised gas operated mobile

(57) The mobile comprises a unit mounted for rotation and associated with a plurality of vessels or blades 1 which are preferably equiangularly spaced about the axis of rotation of the unit. The mobile also comprises a nozzle 7 through which pressurised gas from a source 6 is supplied when, in use, the unit, vessels and nozzle are immersed in a body of liquid in a tank T. The nozzle is arranged to produce a stream of bubbles and so positioned that the bubbles act successively on the vessels whereby the unit is rotated. The vessels may be in the form of railway engines, Fig 3, attached to a belt 16 around two discs 12, 15 and provided with hinged flaps 17, 18 to control entry and exit of air. The device may be used to drive an electric generator or a mill and the pressurised gas may be air compressed by wave power using oscillating water columns.

Fig. 1



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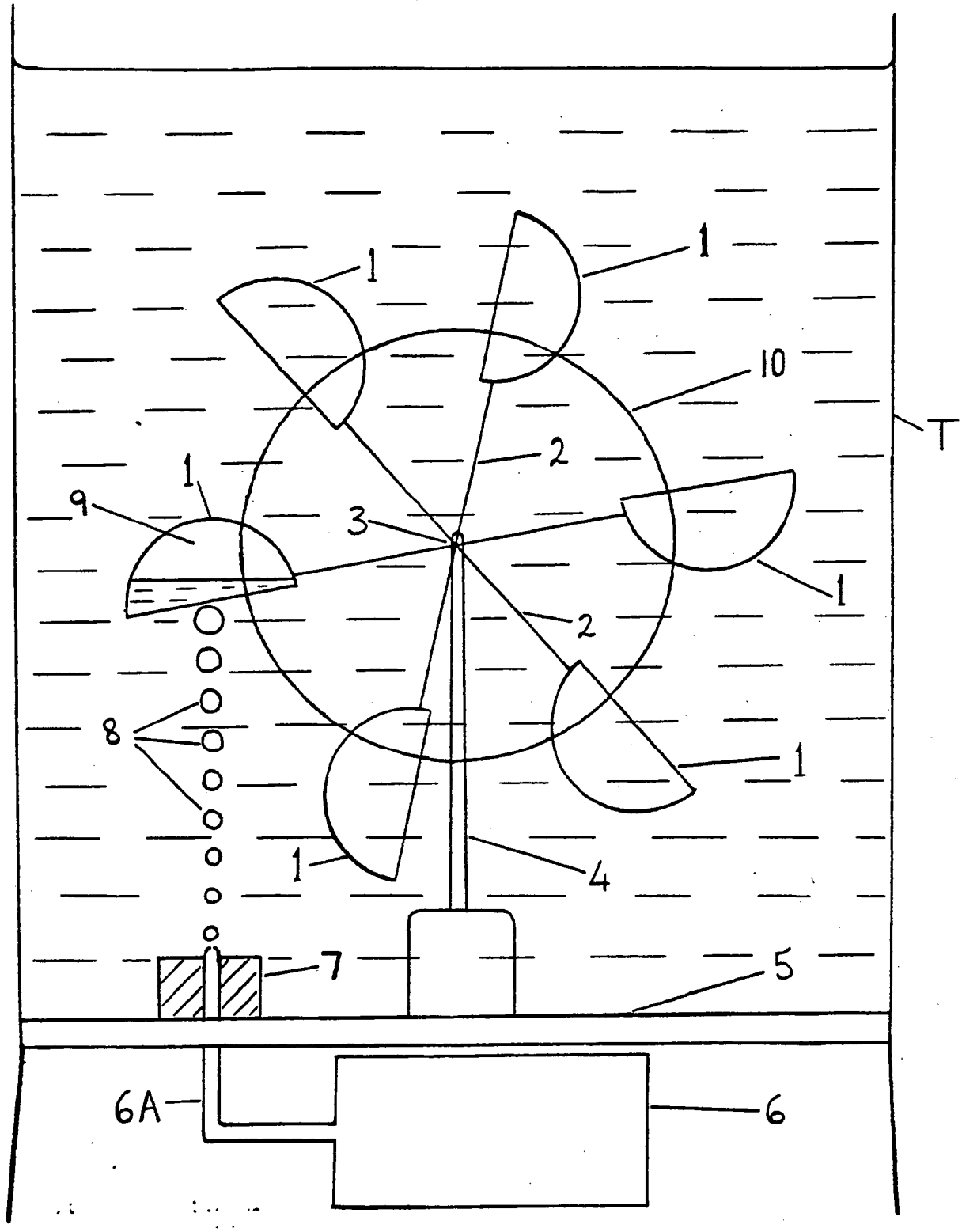

Fig 1

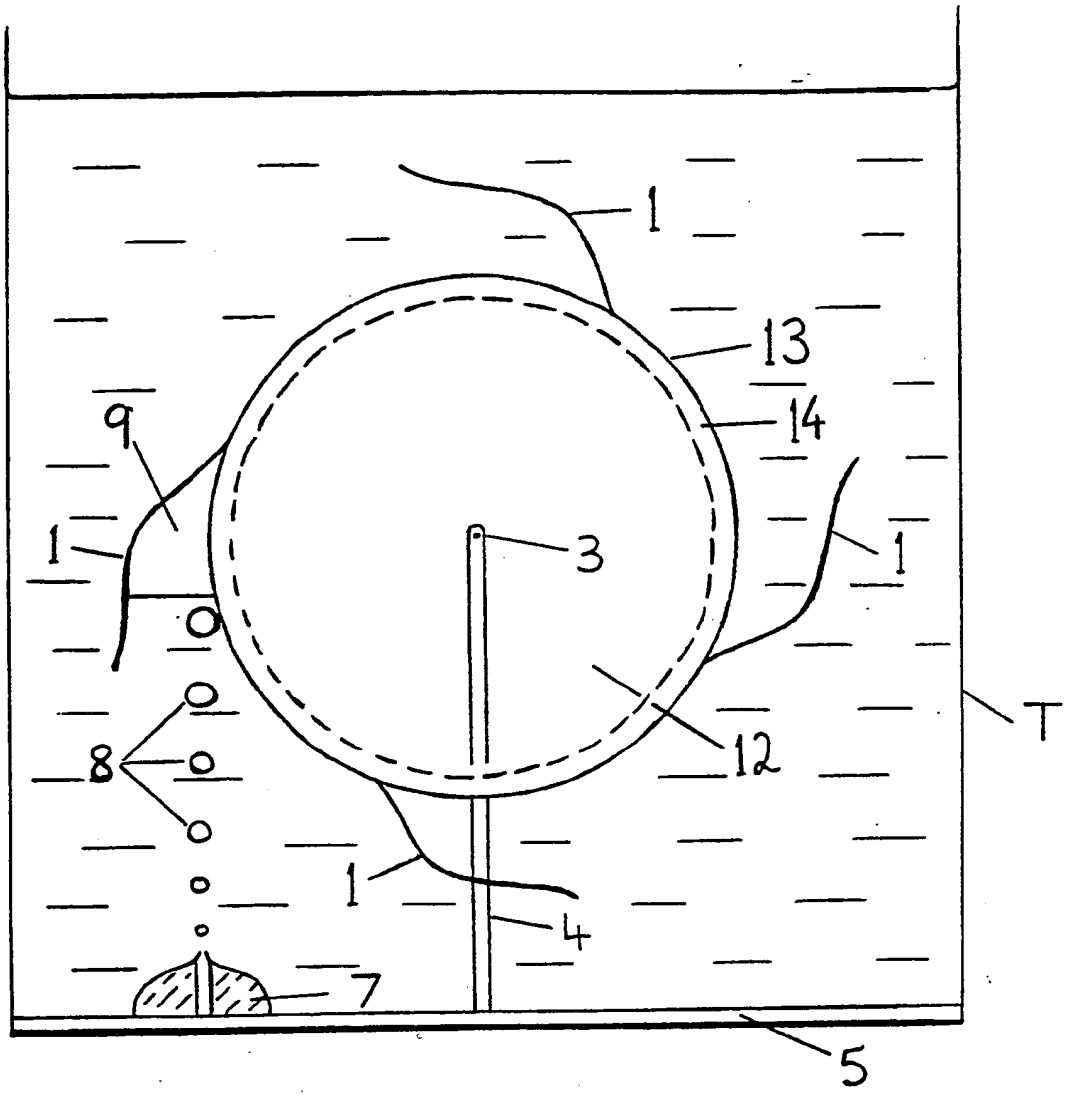

Fig 2

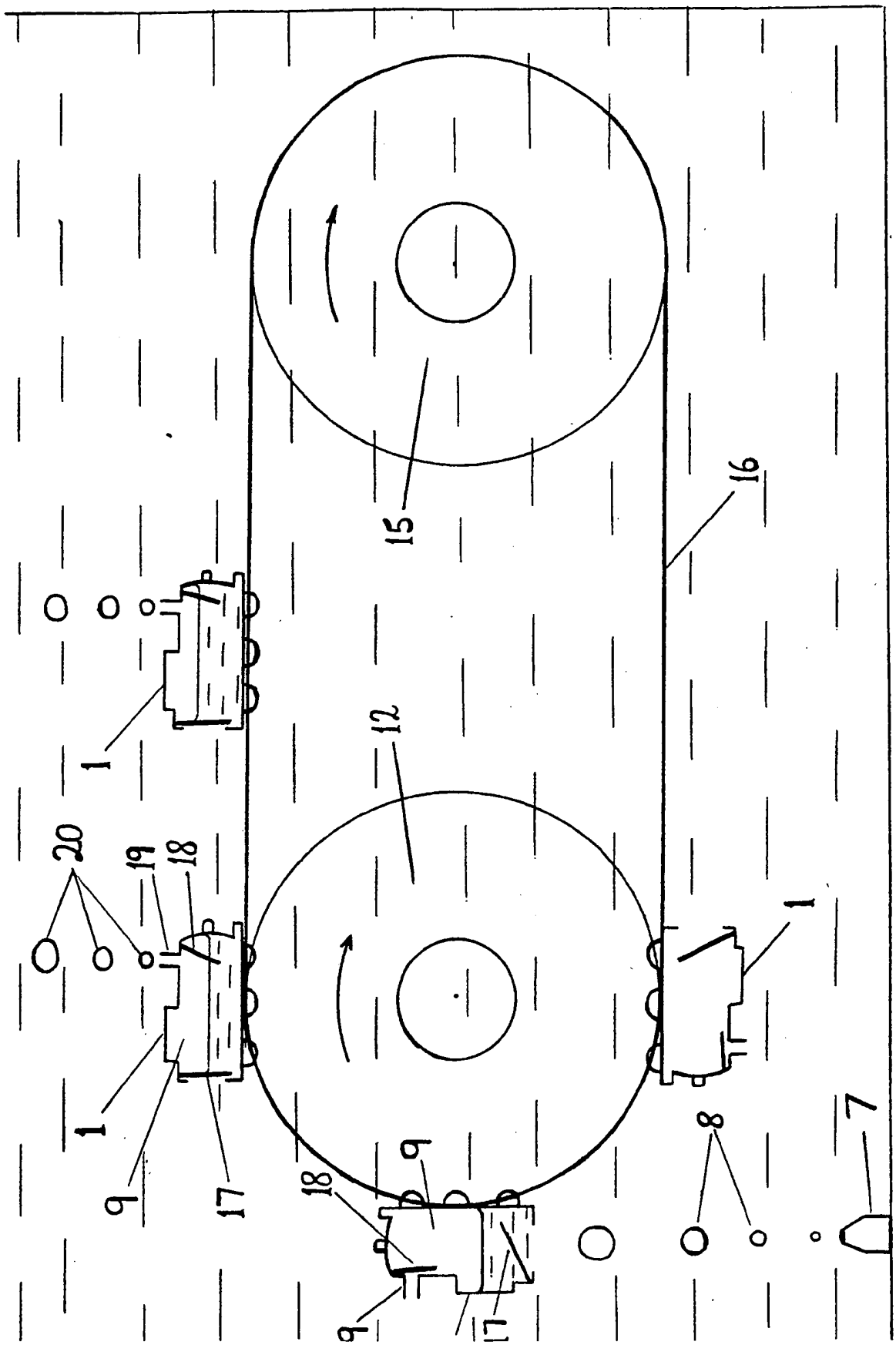

Fig 3

MOBILE

This invention relates to a mobile. A mobile is a device wherein a part or the whole of the device is made to move by the action of a current of fluid, the purpose of which is to provide visual or other entertainment by its movement.

Mobiles currently available are limited to movement in air.

The aim of the present invention is to provide such entertainment in a novel manner by rotary motion, while the whole mobile is immersed in a liquid.

The aim is achieved by a mobile comprising means mounted for rotation, the means being rotatable by a plurality of vessels or blades (hereafter referred to as vessels) displaceable by gas bubbles discharged from a nozzle supplied from a source with pressurised gas, the means, vessels and nozzle being situated in a tank and, when in use, immersed in a body of liquid.

Three embodiments of a mobile according to the invention will now be described, by way of example, with reference to the accompanying diagrammatic drawings, in which :-

Figure 1 is a side elevation of a first embodiment of the mobile,

Figure 2 is a side elevation of a second embodiment of the mobile, and

Figure 3 is a side elevation of a third embodiment of the mobile.

In the first embodiment illustrated in Figure 1, the mobile comprises a number of vessels 1, each of which is rigidly attached to one end of an arm 2. The opposite end of each arm is attached to an axle 3. All the arms 2 are equiangularly distributed around the axle 3. The axle 3 is supported at each end in bearings (not shown) carried by legs 4, such that the axle lies in a substantially horizontal orientation and can rotate freely.

Each vessel has an inlet opening and the vessels 1 are so fixed to the arms 2 that the inlet opening of each vessel 1 faces substantially downwards when the vessel is positioned by one side of a vertical plane containing the axle 3, and faces substantially upwards when positioned on the other side of the vertical plane. The legs 4 supporting the axle 3 are attached to the base 5 of a tank T in which the device is held. A nozzle 7 is also attached to the base 5 so that it is positioned directly below any vessel that is in the 9 o'clock position, using a clock notation. The tank T is filled with water so that the whole device is immersed beneath the surface of the water.

In the embodiment illustrated in Figure 1, a compressor 6 supplies air to the nozzle 7 via a tube 6A. The compressor 6 is positioned, for convenience, beneath the base 5 of the tank T and the tube 6A passes through the base 5. The nozzle 7 in this embodiment incorporates a valve (not shown) which prevents water from entering the tube 6A. When the compressor 6 is in operation, bubbles 8 of air rising vertically from the nozzle 7 enter any vessel 1 positioned substantially directly above the nozzle , thereby displacing the water which is held within that vessel 1. A pocket 9 of air forms within the vessel 1. The resultant buoyant force causes the vessel 1 to move upward, whereby the next vessel 1 moves into the position where it begins to fill with air.

As each vessel 1 moves to the top, the air therein begins to escape, by virtue of the vessel acquiring a disposition whereby the opening in the vessel faces substantially upwards. Water entering the vessel causes it to lose its buoyancy. In this way the process continues as each vessel moves past the vertical plane in either direction, either gaining buoyancy or losing it. Thus a continuous rotation is achieved as long as the bubbles are being discharged.

Additional visual appeal may be obtained by attaching discs 10 to the vessels 1, on either side of the vessels, so that the centres of the discs 10 are mounted on the axle 3. Thus as the vessels 1 rotate the discs 10 also rotate. Suitably designed patterns on the discs 10 may enhance the visual appeal of the mobile. The assembly of all the vessels 1 and their arms 2, with or without the discs 10, will now be called the wheel.

The embodiment illustrated in Figure 1 has six vessels, but in practice any number of vessels may be used. Furthermore the vessels may be of any shape which can use the rising bubbles of air to produce an upward lift of the vessel. Taken to the extreme they can even consist of flat blades which use the force exerted by the upward momentum of the bubbles alone, without any buoyancy factor coming into play.

The embodiment illustrated in Figure 1 shows the compressor 6 fitted beneath the base 5 of the tank T. This is not a specific requirement of the invention, and in practice the compressor may be fitted to any part of the tank, or may be provided as a free-standing unit. The air may be supplied to the nozzle 7 via a tube (not shown) which enters the tank T from above the water level, instead of through the base 5.

While in the first embodiment illustrated in Figure 1 the wheel is carried by an axle 3 rotatably supported by a leg 4 on each side of the wheel, in a variant of this embodiment the wheel is carried by a spindle supported by a single leg on one side of the wheel only in a manner similar to the mounting of the vanes of a windmill. It will be understood that the axle or spindle can either rotate with the wheel or serve a stationary support on which the wheel rotates.

In the second embodiment of the invention illustrated in Figure 2, several vessels 1 are attached to the outer edge of a disk 12, which is mounted at its centre on an axle 3. The axle 3, is at its ends supported by legs 4 which are fixed to the base 5 of a tank T in which the device is held. A nozzle 7 is fixed so that it is positioned substantially beneath any vessel in the 9 o'clock position, using a clock notation. The tank T is filled with water, so that the whole device is immersed.

When air is caused to emerge from the nozzle 7, bubbles 8 of air rise up and fill any vessel 1 which is positioned substantially directly above the nozzle 7. The circumference 13 of the disk 12 is curved concavely inwards towards the centre of the disk 12 to provide a peripheral channel 14 which aids in directing the air into the vessel 1.

The water in the vessel 1 is displaced, and replaced by a pocket 9 of air. The resultant buoyant force acting upon the vessel 1 causes the vessel to move upwards. The disk 12 is made to move in a clockwise direction, as represented in the embodiment illustrated, and the next vessel 1 along moves into the position where it begins to fill with air, gaining buoyancy and moving upwards. Thus a continuous rotation of the disk 12 is achieved.

In a variation of both the embodiments previously described, instead of the ends of the axle 3 being supported by one or more legs 4, the ends of the axle 3 are supported directly in bearings or mountings (not shown) carried by the sides of the tank T.

A third embodiment of the invention is illustrated in Figure 3. This embodiment is similar in principle to the previously described embodiments, in that several vessels 1, which are immersed in a tank T of water, are made to travel about a primary disc 12, by virtue of the buoyant force acting upon them when they are filled with bubbles 8 of air rising from a nozzle 7 from which the bubbles are emitted.

In this embodiment however, in addition to the primary disk 12, there is provided a secondary disk 15 of substantially the same size and lying in substantially the same plane. The two disks 12, 15 are interconnected by an endless belt 16 running around their circumferences, as shown in Figure 3.

Each vessel 1 is shaped substantially in the manner of a railway engine. The back of each engine is left open to provide an inlet opening for the air bubbles 8. The inlet opening may be covered by a first hinged flap 17. Unlike the first two embodiments, this embodiment has an air outlet opening in the shape of a funnel 19 of the engine. The outlet opening may be covered by a second hinged flap 18.

The principle of mobility of the vessels is essentially as described in the previous embodiments. As each vessel 1 becomes positioned above the nozzle 7, it becomes filled with a pocket of air 9, the buoyancy of which causes the vessel 1 to move upwards. The pressure of the bubbles 8 pushes back the first hinged flap 17 so that it does not act as an obstruction to the passage of air, at this stage. The

second hinged flap 18 does obstruct the passage of air through the outlet opening in the funnel 19, by virtue of its suspended position and the pressure of the air acting against it.

As the vessel 1 moves upwards and around the disc 12, the orientation of the vessel changes so that the first hinged flap 17 falls to a vertical position, encouraged by the force of the air trapped within the vessel. The flap 17 then acts to obstruct the release of air from the vessel through the inlet opening at the back of the engine. The second flap 18 however, falls away from the outlet opening in the funnel 19, so allowing trapped air to escape from the vessel via the funnel. The flap 18 is sufficiently heavy so that it can swing downwards against the pressure of the air which tends to keep it in a position where it blocks the outlet opening.

The vessels 1 are all attached at regular intervals to the belt 16 which encircles both the discs 12, 15. As each vessel 1 reaches the top of the primary disc 12, it moves in a horizontal direction towards the top of the secondary disc 15. The escaping bubbles 20 of air give the impression of smoke emerging from the funnel of the engine. The size of the outlet opening in the funnel 19 is designed with due consideration to the capacity of the vessel 1 and the distance between the axes of the discs 12, 15, so that all the air will have escaped by the time the vessel reaches the top of the secondary disc 15, and the vessel no longer has any buoyancy which would hinder it from moving downwards around the secondary disc 15.

Thus a continuous motion is achieved of vessels moving round the discs 12,15 in the manner of a conveyor belt. If the lower half of the tank T up to the tops of the discs 12,15 is made opaque, then an observer from a substantially

horizontal level would only see a succession of engine-shaped vessels moving across the tank emitting bubbles of air from their funnels. In practice the vessels may be made in any of a variety of shapes, for example fish, which provide entertainment and amusement.

In all the embodiments described a liquid other than water may be used for immersion, and may be lightly coloured. With suitable underwater lighting the whole system should provide a pleasant form of visual entertainment. If the device is used in an aquarium then it is useful for aerating the water by the bubbles of air which are used to power the system.

The invention could also be used as a turbine for driving an electric generator or mill, where the source of compressed air may be obtained from the utilisation of wave power using oscillating water columns for example.

CLAIMS

1. A mobile comprising a unit, mounted for rotation and associated with a plurality of vessels or blades (hereinafter: vessels), and a nozzle, the unit, vessels and nozzle being immersed, in use of the mobile, in a body of liquid in a tank, and the nozzle being supplied with pressurised gas from a source and being arranged to produce a stream of bubbles, the relative position of the unit and nozzle being such that the bubbles act successively on the vessels whereby the unit is rotated.

2. A mobile according to Claim 1 wherein the unit is carried by an axle or spindle (hereinafter: axle), the axle either carrying the unit rotatably or being itself rotatably mounted.

3. A mobile according to Claim 1 or 2 wherein the vessels are equiangularly distributed around the axis of rotation of the unit.

4. A mobile according to any one of Claims 1 to 3 wherein each vessel comprises an opening for receiving the bubbles.

5. A mobile according to any one of Claims 1 to 4 wherein the nozzle incorporates a non-return valve.

6. A mobile according to any one of Claims 1 to 5 wherein the unit incorporates a disc-shaped structure.

7. A mobile according to Claim 6 wherein the disc-shaped structure is provided with a peripheral channel.

8. A mobile according to any one of Claims 1 to 5 comprising two spaced-apart units, each in the form of a disc, the two discs being interconnected by an endless strand running around their circumferences, the strand carrying a plurality of

said vessels.

9. A mobile according to Claim 8 wherein each of the vessels is in the form of a railway engine, the back of which is provided with an inlet opening and the funnel of which serves as an outlet opening for the bubbles.

10. A mobile according to Claim 9 wherein each of the openings is controlled by a hinged flap.

11. A mobile according to Claim 1 constructed, arranged and adapted to operate substantially as herein described with reference to, and as shown in, the accompanying drawings.